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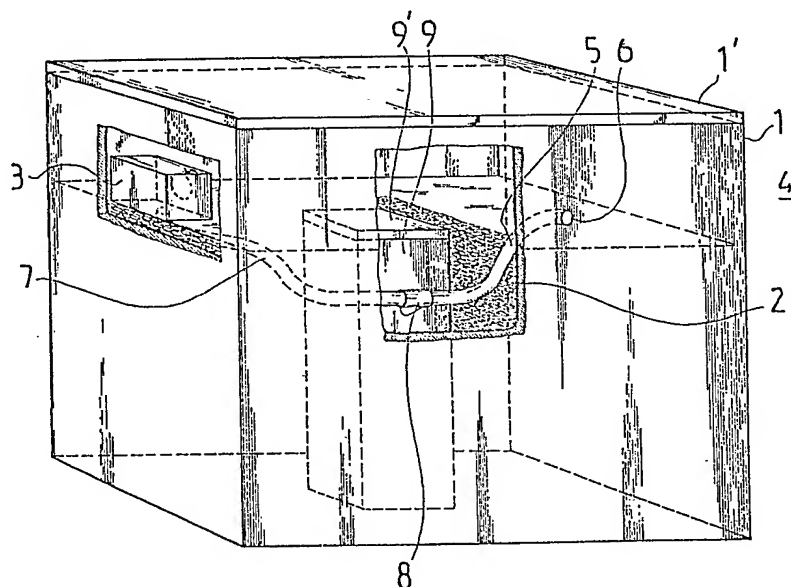
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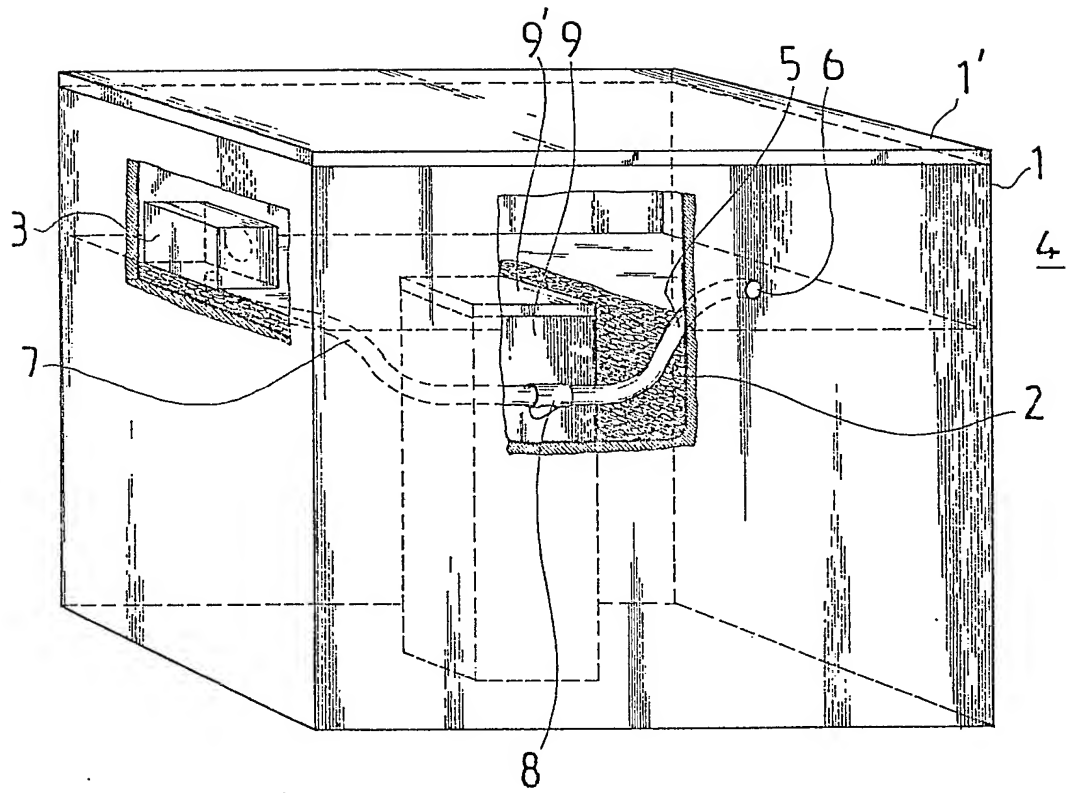
(56) Documents cited
GB 1482625
GB 1234807

(58) Field of search
C1C
Selected US specifications from IPC sub-class C02F

(54) Heating arrangement for a biological filter intended for the treatment of waste waters

(57) The filter material is heated by means of preheated air, and the apparatus comprises intake openings (6) for outdoor air, a member (5) for heating the outdoor air, a blower (3) for blowing the heated air through the filter material layer, as well as air exhaust openings. The said heating member comprises a heat exchanger (5) fitted as operative between the intake openings (6) and the blower (3), the warmer side of the said heat exchanger being in contact with the waste water coming into the filter, whereby the outdoor air becomes warm by the effect of the quantity of heat transferred from the waste water. The heat exchanger (5) favourably consists of a hose made of aluminium, which hose interconnects the intake openings (6) and the blower (3) and which is fitted so as to pass at least partly in the waste water flowing in the filter.





SPECIFICATION

Heating arrangement for a biological filter intended for the treatment of waste waters

5 The present invention concerns an arrangement in accordance with the preamble of claim 1, which is intended for the heating of a biological filter used in the treatment of waste waters. In such an arrangement, the filter is heated by means of air coming from outside. The arrangement usually comprises intake openings for the outside air, members for heating the outside air, a blower, and air exhaust openings.

15 Several different biological filters or biofilters are known. It is a common feature of all of the solutions that, in order to be operative, the population of bacteria that is present in the filter and that decomposes the impurities in the waste waters requires a constant supply of fresh air and a suitable ambient temperature. In order that these two critical factors could be controlled at the same time, recently a solution has become common in which the filter material proper, i.e. the filler material
25 made of plastic or similar material, is heated by means of preheated air. In such a case, the filter is placed in a closed container. In the upper or lower part of the container, ventilation openings have been formed, through which air flows freely or is sucked by means of a blower. The air is exhausted through openings placed at the opposite side of the container. During the cold season, the air is heated, e.g., by means of an electric resistor.

Thus, in the above solutions, either the filter is
35 frozen in cold weather or, alternatively, external energy is required to prevent freezing.

It is an object of the present invention to provide a solution of an entirely novel sort for heating the air blown through the biofilter. The invention is
40 based on the idea that, for the purpose of heating the outdoor air coming in through the ventilation openings, the air is passed through a heat exchanger whose warmer side is in contact with the waste water introduced into the filter. Thus, the intake air is heated by making use of the heat content in the waste water.

More specifically, the arrangement in accordance with the invention is mainly characterized in what is stated in the characterizing part of claim 1.

50 In the invention, it is possible to use any conventional heat exchanger whatsoever, such as a tubular or plate heat exchanger. The inlet opening of the cold side of the exchanger is connected via a pipe or hose with the air intake openings, and the exhaust opening in a corresponding way with a blower placed in the container. The waste water is either allowed to flow freely at the warm side of the heat exchanger, or it is brought into a forced circulation by means of a pump.

60 In a preferred embodiment of the invention, the heat exchanger comprises a pipe made of a heat-conductive material, which is connected to the intake opening and to the blower by its ends. The pipe is fitted so that it passes at least partly in the
65 waste water flowing in the filter. As such a pipe,

preferably a spiral pipe made of aluminium is used. As regards its construction, the said pipe is flexible, and therefore, out of it, several loops present in the waste water flow are readily produced, whereby the heat transfer area becomes quite large.

70 Besides aluminium, it is also conceivable to use other heat-conductive materials for the manufacture of the pipe or hose, such as metals or alloys durable in waste water. The pipe or hose may also be
75 made of some ordinary basic material of poor heat conductivity, wherein heat-conductive portions, such as metal pipes, are fitted at regular intervals.

As a particular feature related to the invention
80 should be mentioned the possibility of recirculation of the heated air, which can be accomplished by means of the invention very easily. An opening is formed into the hose or pipe functioning as the heat exchanger, which said opening is in connection with the air exhaust openings. In this way,
85 part of the heating air that has passed through the filter layer may be combined with the fresh supply of air and passed again through the blower into the filter layer. By selecting the size of the opening appropriately, an optimal recirculation ratio is
90 readily achieved.

The invention, and in particular its preferred embodiment involves several advantages. The most important ones of them are the following:

- 95 - external thermal energy is not required, one electric component, the heating resistor, can be omitted,
- when air is recirculated, new (cold) outdoor air has to be sucked into the system as a smaller quantity, and
- 100 - no moving components are needed in the system.

A preferred embodiment of the invention will now be described, by way of example only, with the aid of the accompanying drawing, which is an illustration of principle of the mode of accomplishing the heating arrangement in accordance with the invention.

The container part of the biofilter comprises a mantle 1, which is provided with a sealed roof 1'. Inside the container, the biofilter material 2 proper is placed, as well as, in its immediate proximity, a blower 3. To the suction side of the blower, a hose 5 is attached, whose opposite end is connected to the intake opening 6. The air coming from outside
115 4 is sucked along the hose 5 into the blower 3, from which it is blown further through the biofilter filler material 2, being removed through the exhaust openings (not shown) formed in the bottom of the container part, to the outside air or into the sewer.

The hose 5 is made of aluminium and fitted, in the way shown in the figure, underneath the surface of the waste water. The intake air becomes
125 warm by the effect of the conveyance of heat taking place out of the waste water through the wall 7 of the hose. In the hose 5, a T-branch piece is fitted, whose opening 8 that opens itself to the side is connected with the space 9. This space 9, which
130 is provided with a cover 9' and which is preferably

gas-tight, is again, in a way not shown, connected with the air exhaust openings. Some of the air that has become warm in the hose 5 and that has passed through the biofilter is returned through the space 9 and the T-branch to the air circulation. A recirculation ratio between two and three has proved advantageous in practice. If the outdoor air is warmer than the waste water (this may often be the case in summer), some of the moisture contained therein condenses. In view of such an occurrence, the hose 5 should preferably be placed in the container so that the T-piece is located as low as possible. Thereby the condensate water flows out through the space 9.

Within the scope of the invention, it is also possible to think of solutions differing from the exemplifying embodiment described above. Thus, besides a solution based exclusively on the heat content in the waste water, a heating arrangement may also be concerned that is also provided with a thermistor-controlled heating resistor. In such a case, the said resistor is switched on only if the temperature of the blowing air does not become sufficiently high by means of the heat transfer alone.

CLAIMS

1. Heating arrangement for a biological filter intended for the treatment of waste waters, in which arrangement the filter is heated by means of air coming from outside and which said arrangement comprises
 - intake openings (6) for outdoor air,
 - a member (5) for heating the outdoor air,
 - a blower (3) for blowing the heated air through the layer of filter material, as well as
 - exhaust openings for air,characterized in that the said member comprises a heat exchanger (5) fitted as operative between the intake openings (6) and the blower (3), the warmer side of the said heat exchanger being in contact with the waste water coming into the filter, whereby the outdoor air becomes warm by the effect of the quantity of heat transferred from the waste water.
2. Arrangement as claimed in claim 1, characterized in that the heat exchanger (5) consists of a hose or equivalent made of a heat-conductive material, which said hose interconnects the intake openings (6) and the blower (3) and which is fitted so that it passes at least partly in the waste water flow flowing in the filter.
3. Arrangement as claimed in claim 2, characterized in that the hose (5) is made of aluminium.
4. Arrangement as claimed in claim 2 or 3, characterized in that an opening (8) has been formed into the hose (5), which said opening is in connection with the air exhaust openings, whereby some of the heating air that has passed through the filter layer (2) can be recirculated.

5. Heating arrangement for a biological filter for the treatment of waste waters, substantially as described herein with reference to the accompanying drawing.

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DERWENT-ACC-NO: 1986-227389**DERWENT-WEEK:** 198944*COPYRIGHT 2008 DERWENT INFORMATION LTD***TITLE:** Biological filter with preheat of air supply using
aluminium tube submerged in waste water**INVENTOR:** SALOKANGAS A**PATENT-ASSIGNEE:** EKOFINN OY AB[EKOFN]**PRIORITY-DATA:** 1985FI-000738 (February 22, 1985)**PATENT-FAMILY:**

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GB 2171401 A	August 28, 1986	EN
SE 8600754 A	August 23, 1986	SV
FI 8500738 A	August 23, 1986	FI
US 4693816 A	September 15, 1987	EN
GB 2171401 B	September 6, 1989	EN
SE 460473 B	October 16, 1989	SV

APPLICATION-DATA:

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GB 2171401A	N/A	1985GB- 010939	April 30, 1985
US 4693816A	N/A	1986US- 832585	February 24, 1986

INT-CL-CURRENT:

TYPE

IPC DATE

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BASIC-ABSTRACT:

Waste water is treated in a biological filter with an air supply. Air is drawn in from outdoors by a blower which has an inlet tube which is submerged within the waste water. This tube acts as a heat exchanger for preheating the inlet air using the heat of the waste water. Pref. the tube is aluminium.

ADVANTAGE - For most of the year it is not necessary to supply additional thermal energy to the filter.

TITLE-TERMS: BIOLOGICAL FILTER PREHEAT AIR SUPPLY
ALUMINIUM TUBE SUBMERGED WASTE
WATER

DERWENT-CLASS: D15 P81 Q78

CPI-CODES: D04-A01J;

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